

REMARKS

AMENDMENTS

New claims 14 and 15 are introduced herein, supported by claims 1 and 2 as filed, and also by the specification, e.g., at page 6:8-21. These claims are in *prima facie* condition for allowance.

REJECTION UNDER 35 USC §103(A)

The examiner rejects claims 1-12 under 35 USC §103(a) over Tani et al. (JP 10-231317). To make a *prima facie* case of obviousness, the prior art must teach or suggest each claim element, give some suggestion or motivation to make the claimed invention, and also give a reasonable expectation for success in doing so (see, e.g., *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986); *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)). The cited reference does not meet these requirements.

As previously indicated, the presently claimed process produces polyethylenes having higher molecular weights and melting points than those produced by the process disclosed in Tani. Examples 1-8 of Tani utilize catalysts comparable to those of the unamended claims. Catalysts A-C and E in examples 1-4 and 7-8 contain 1,3,5-triisopropylhexahydro-1,3,5-triazines, and catalyst D in examples 5-6 contains a 1,3,5-trimethylhexahydro-1,3,5-triazine. Catalysts B, C, and D produced high levels of oligomers, except in the case of example 7, where the process using catalyst D was

carried out for three hours. Similarly, examples 1 and 2 produced some polymer, but only when the process was carried out for from two to four hours. Even then, the yields were low and the process required additional activators to increase the yield between example 1 and example 2.

*not all examp. listed on Table 1 of p22*

The catalyst of present example 8 contains a 1,3-dimethyl-5-(2-hydroxyethyl)-1,3,5-triazacyclohexane. The difference between this and that of catalyst D in Tani is small, and yet the resulting polymerization is strikingly different. After only one hour of polymerization time, the resulting products of examples 20 and 21 had molecular weights of 46,729 g/mol and 36,659 g/mol. This high molecular weight and low processing time was unexpected, especially where Tani required longer processing time to produce samples with low oligomer proportions, and where the ligands are so similar.

The melting points determined for the products of present examples 11-19, from 126.1°C to 138°C, also indicate that oligomers were substantially absent from those products. Oligomer fractions such as those produced in the Tani process would lower this melting point significantly (see n-alkane melting point chart appended hereto).

Additionally, present examples 1 and 2, using the ligand 1-(2-oxidoctyl)-1,4,7-triazacyclononane produced polyethylenes having molecular weights of 205,282 g/mol and 139,792 g/mol, also after a residence time of only one hour. These ligands differ somewhat more than those of examples 20 and 21, and yet comparative results from catalysts using similar ligands matching those disclosed in Tani were reported in the specification. There, applicants stated that polymerization using N,N',N''-trimethyl-

1,4,7-triazacyclononane ligand-containing catalysts yielded only dimers. Surprisingly, the same catalysts having a donor functionality produced polymers having the above molecular weights. These results are unexpected in view of Tani.

Applicants respectfully submit that the foregoing remarks demonstrate support for the conclusion set forward in their previous reply, and are commensurate with the scope of the claimed invention. Further, the structure of the ligands in the process differentiate the present claims from the disclosure of Tani, and there is no need to include a molecular weight limitation.

For purposes of speeding prosecution of this case, applicants have introduced new claims drawn to those processes wherein the ligand of component A is covalently bonded to the transition metal complex. Tani makes no suggestion for covalently bonding the cyclic polyamine disclosed on page 5:[0006] to the vanadium or chromium compound disclosed on page 7:[0011]. Further, such covalent bonding is not obvious to one of skill in the art, as it would be viewed to block the catalytic complex, thus prohibiting polymerization, or at very least, reducing the polymerization results. Accordingly, the necessary requirements for obviousness over Tani, et al. are not met with regard to new claims 14 and 15.

#### CONCLUSION

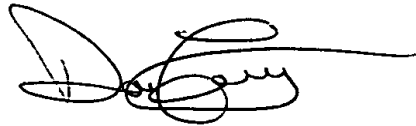
In view of the foregoing amendments and remarks, applicants consider that the rejections of record have been obviated and respectfully solicit passage of the application to issue.

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**Please find attached a check for \$110.00 for a one month extension of time.**

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Respectfully submitted,  
KEIL & WEINKAUF

A handwritten signature in black ink, appearing to read 'David C. Liechty', with a long horizontal flourish extending to the right.

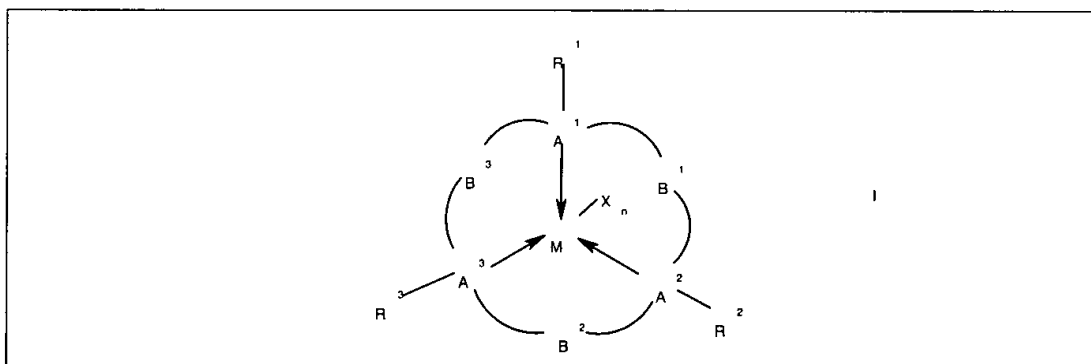
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**COPY OF ALL CLAIMS**

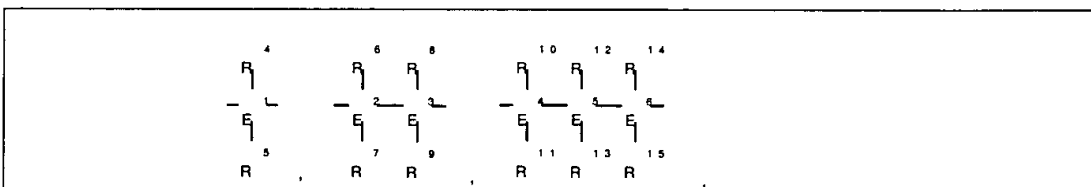
1. (previously presented) A process for the polymerization of olefins, which comprises carrying out the polymerization in the presence of catalysts, comprising the following components:
  - (A) at least one complex of a transition metal with a tridentate macrocyclic ligand which bears at least one substituent having a donor function and
  - (B) optionally, one or more activator compounds.
  
2. (previously presented) A process as claimed in claim 1, wherein the component (A) is a compound of the formula I



where the variables have the following meanings:

M is a transition metal of groups 3 to 12 of the Periodic Table,

B¹-B³ are each a divalent radical selected from the group consisting of



where

$E^1-E^6$  are silicon or carbon and not more than two of  $E^4-E^6$  are silicon,

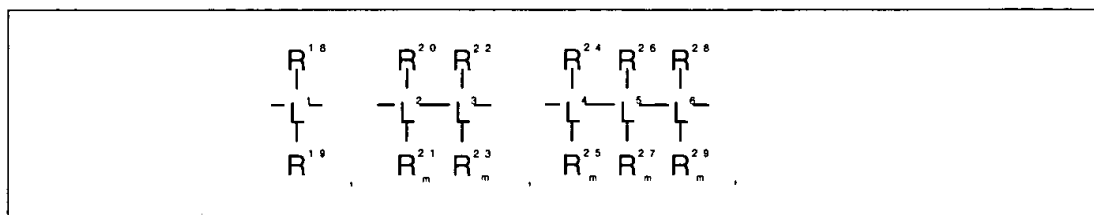
$A^1-A^3$  are nitrogen or phosphorus,

$R^1-R^{15}$  are hydrogen,  $C_1-C_{20}$ -alkyl, 5- to 7-membered cycloalkyl which may in turn bear a  $C_6-C_{10}$ -aryl group as substituent,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part,  $SiR^{32}_3$  or a radical of the formula  $-Z-D$ , where the organic radicals  $R^1-R^{15}$  may be substituted by halogen(s) and any two geminal or vicinal radicals  $R^1-R^{15}$  may also be joined to form a five- or six-membered ring, and at least one of the radicals  $R^1-R^{15}$  is a radical  $-Z-D$ ,

where

D is  $NR^{16}R^{17}$ ,  $NR^{16}$ ,  $OR^{16}$ , O,  $SR^{16}$ , S,  $PR^{16}R^{17}$ ,  $SO_3R^{16}$ ,  $OC(O)R^{16}$ ,  $CO_2$ ,  $C(O)R^{16}$ ,  $C(NR^{16})R^{17}$ , CN or a five- or six-membered heterocyclic ring system, where the radicals  $R^{16}-R^{17}$  may also be joined to Z to form a five- or six-membered ring;

Z is a divalent radical selected from the group consisting of:



where

$L^1-L^6$  are silicon or carbon, not more than two of  $L^4-L^6$  are silicon and  $m=0$  if any two of the vicinal radicals  $R^{20}$ ,  $R^{22}$ ,  $R^{24}$ ,  $R^{26}$  and  $R^{28}$  form an aromatic ring or a double bond is formed between two adjacent  $L^2-L^6$ , and otherwise  $m=1$ ,

$X$  are, independently of one another, fluorine, chlorine, bromine, iodine, hydrogen,  $C_1-C_{10}$ -alkyl,  $C_2-C_{10}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having 1-10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part,  $NR^{30}R^{31}$ ,  $OR^{30}$ ,  $SR^{30}$ ,  $SO_3R^{30}$ ,  $OC(O)R^{30}$ ,  $CN$ ,  $SCN$ ,  $=O$ , b-diketonate,  $BF_4^-$ ,  $PF_6^-$  or bulky noncoordinating anions,

$R^{16}-R^{31}$  are hydrogen,  $C_1-C_{20}$ -alkyl, 5- to 7-membered cycloalkyl which may in turn bear a  $C_6-C_{10}$ -aryl group as substituent,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part,  $SiR^{32}_3$ , where the organic radicals  $R^{16}-R^{31}$  may be substituted by halogen(s) and any two geminal or vicinal radicals  $R^{16}-R^{31}$  may also be joined to form a five- or six-membered ring,

$R^{32}$  are, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl, 5- to 7-membered cycloalkyl which may in turn bear a  $C_6-C_{10}$ -aryl group as

substituent, C<sub>2</sub>-C<sub>20</sub>-alkenyl, C<sub>6</sub>-C<sub>20</sub>-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and any two geminal radicals R<sup>32</sup> may also be joined to form a five- or six-membered ring,

n is a number from 1 to 4 which corresponds to the oxidation state of M or, if D is covalently bound to the metal center M, the oxidation state of M minus the number of groups D covalently bound to M, and, furthermore, the value of n is reduced by 1 for each X=oxygen.

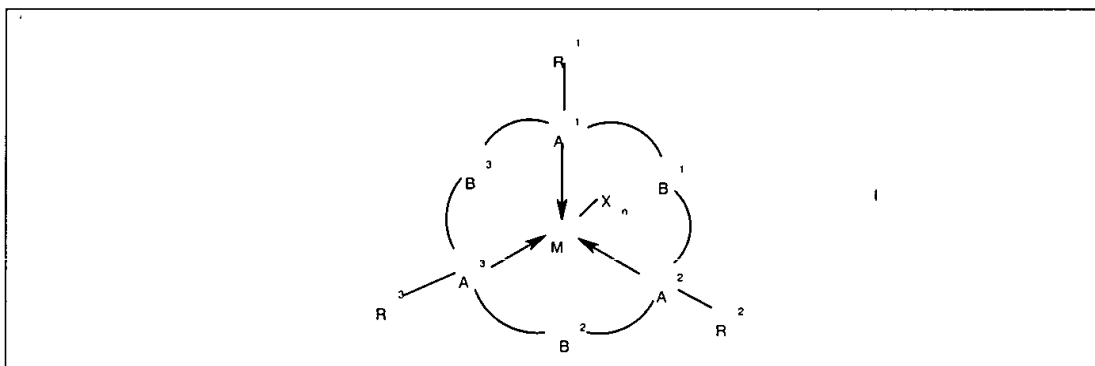
3. (original) A process as claimed in claim 2, wherein only R<sup>1</sup> is a radical -Z-D.
4. (previously presented) A process as claimed in claim 2, wherein B<sup>1</sup>, B<sup>2</sup> and B<sup>3</sup> are identical.
5. (previously presented) A process as claimed in claim 2, wherein D is oxygen, NR<sup>16</sup>, NR<sup>16</sup>R<sup>17</sup> or CN.
6. (previously presented) A process as claimed in claim 1, wherein the transition metal M comes from groups 3 to 8 of the Periodic Table.
7. (previously presented) A process as claimed in claim 1, wherein the transition metal M comes from group 6 of the Periodic Table.
8. (previously presented) A process as claimed in claim 1, wherein a compound selected from the group consisting of aluminoxane, dimethylanilinium tetrakis(pentafluorophenyl)borate, trityl tetrakis(pentafluorophenyl)borate and tris(pentafluorophenyl)borane is used as activator compound (B).



9. (previously presented) A process as claimed in claim 1, wherein at least one olefin selected from the group consisting of ethene, propene, 1-butene, 1-pentene, 1-hexene, 1-heptene or 1-octene is polymerized.
10. (previously presented) A process as claimed in claim 1, wherein the polymerization is carried out in suspension or in the gas phase.
11. (previously presented) A process as claimed in claim 1, wherein at least one metal complex (A) in the presence of at least one catalyst (C) customary for the polymerization of olefins and, optionally, one or more activator compounds (B) is used.
12. (previously presented) A catalyst system comprising the following components:
  - a) at least one transition metal complex (A) as defined in claim 1 and
  - b) at least one activator compound (B).
13. (withdrawn)
14. (new) A process for the polymerization of olefins, which comprises carrying out the polymerization in the presence of catalysts comprising the following components:
  - (A) at least one complex of a transition metal with a tridentate macrocyclic ligand which bears at least one substituent having a donor function, wherein the macrocyclic ligand is covalently bonded to the transition metal and

(B) optionally, one or more activator compounds.

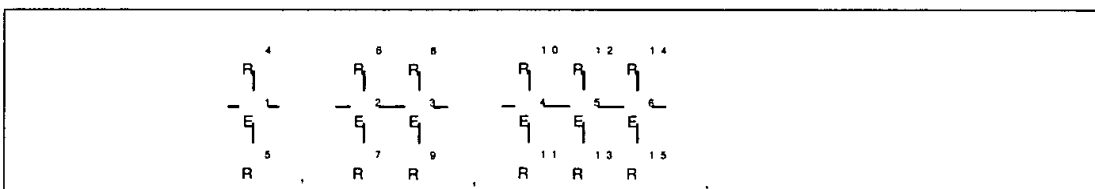
15. (new) A process as claimed in claim 1, wherein the component (A) is a compound of the formula I



where the variables have the following meanings:

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B¹-B² are each a divalent radical selected from the group consisting of



where

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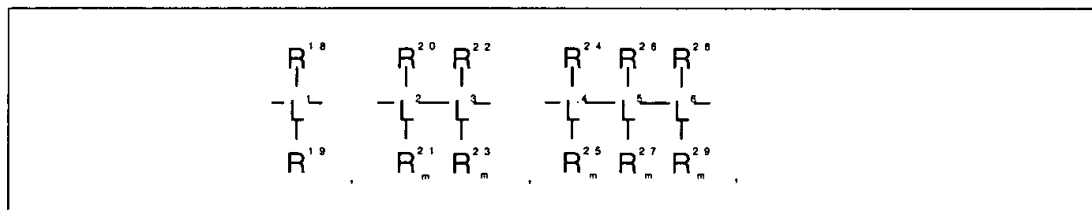
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where

D is  $NR^{16}R^{17}$ ,  $NR^{16}$ ,  $OR^{16}$ , O,  $SR^{16}$ , S,  $PR^{16}R^{17}$ ,  $SO_3R^{16}$ ,  $OC(O)R^{16}$ ,  $CO_2$ ,  $C(O)R^{16}$ ,  $C(NR^{16})R^{17}$ , CN or a five- or six-membered heterocyclic ring system, where the radicals  $R^{16}-R^{17}$  may also be joined to Z to form a five- or six-membered ring, and where D is covalently bonded to the transition metal M;

Z is a divalent radical selected from the group consisting of:



where

$L^1-L^6$  are silicon or carbon, not more than two of  $L^4-L^6$  are silicon and  $m=0$  if any two of the vicinal radicals  $R^{20}$ ,  $R^{22}$ ,  $R^{24}$ ,  $R^{26}$  and  $R^{28}$  form an aromatic ring or a double bond is formed between two adjacent  $L^2-L^6$ , and otherwise  $m=1$ ,

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$R^{16}-R^{31}$  are hydrogen,  $C_1-C_{20}$ -alkyl, 5- to 7-membered cycloalkyl which may in turn bear a  $C_6-C_{10}$ -aryl group as substituent,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part,  $SiR^{32}_3$ , where the organic radicals  $R^{16}-R^{31}$  may be substituted by halogen(s) and any two geminal or vicinal radicals  $R^{16}-R^{31}$  may also be joined to form a five- or six-membered ring,

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n is a number from 1 to 4 which corresponds to the oxidation state of M or, if D is covalently bound to the metal center M, the oxidation state of M minus the number of groups D covalently bound to M, and, furthermore,

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the value of  $n$  is reduced by 1 for each X=oxygen.

